Feynmans Inverse Sprinkler

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This research focuses on Feynman's question, why inverse sprinklers, sucking fluids in, instead of blowing them out, rotate. The conducted experiments using static sprinklers and a highly sensitive experimental setup show, that sucking water in does not cause a permanent propelling force or torque. When the pump is switched on, a transient force occurs, rotating the inverse sprinkler a bit and thus defining the initial direction of rotation. To study the complete rotating inverse sprinkler, a complex and nearly frictionless experimental setup was used. Experiments with different sprinkler dimensions have shown that inverse sprinklers with a greater diameter rotate more slowly. In conjunction with theoretical considerations regarding the drag, it can be concluded that the propelling torque is linearly dependent on the rotational frequency. Further studies have shown that this torque originates from a process in the T-shaped pipe which connects the two L-shaped pipes together. If the inverse sprinkler does not rotate, both water-jets coming from the L-shaped pipes collide symmetrically, thus there is no torque. When the inverse sprinkler turns, the Coriolis force deflects the jets so that they transfer a part of their momentum to the sprinkler wall. The resulting torque acts in the direction of rotation and thus propels the inverse sprinkler. The direction of rotation therefore only depends on the initial rotation. So Feynman's question can finally be answered after over 70 years. Furthermore the rotational frequency can be calculated through the drag and the propelling torque described above.

Awards Won:

Fourth Award of $500